JPRS 80133

18 February 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 92

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ELECTRONICS

AEG TELEFUNKEN DEVELOPMENT CENTER FOR INTEGRATED CIRCUITS

Essen ELEKTRONIK APPLIKATION in German Dec 81 pp 21-22

> [Text] AEG Telefunken has set up a development center in Ulm for integrated circuits which is available to the technical departments in all questions of microelectronics, both in an advisory and cooperative role. It is notable that the potentials of this development center are also offered to small and medium-sized firms. These firms can contract for the same or similar tasks as the technical departments.

The trend observed in recent years in microelectronics will doubtless continue through new technologies and circuit principles. A graphic illustration (figure 1) shows the movement of complexity and price of integrated circuits in the period from 1970 to 1990. It is expected that by the year 1990, several million components will be housed on one chip with a simultaneous reduction in price by more than 30 percent. This development also leads to a change in the classical production structure. Whereas it breaks down into component, assembly, subsystem, unit and system, today, large integrated circuits (uP) already have the character of assemblies or subsystems. For the component manufacturer it is thus tempting to move into the area of subsystems and systems and to produce his own microcomputers for instance.

In order to maintain his market position among component manufacturers, the unit and system producer must also have direct access to the potentials of IC technology in order to keep his units competitive in the market. In Europe this is often done today by purchasing or building semiconductor factories in the USA. However, usually the interests of the semiconductor factory cannot be grought into harmony with those of the equipment manufacturer, e.g. for development-intensive but low production work. Another possibility is to create internal design activities aimed mainly at supporting the system and equipment developer. This method was selected by AEG Telefunken with the founding of the development center (figure 2) for integrated circuits next to the existing semiconductor factory. This is not an external section of the semiconductor factory, but a center which stands with the equipment developers through product development in order to have optimal systems, regardless of production volumes, by means of integrated circuits.

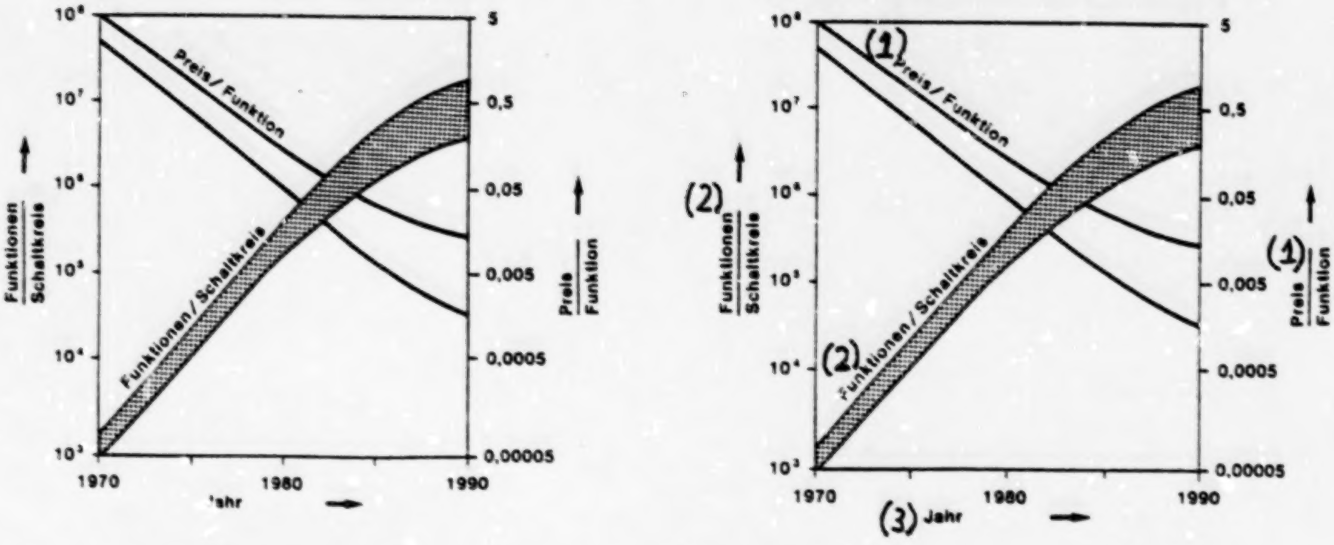

Figure 1. Complexity and Price of Integrated Circuits between 1970 and 1990

Key: 1. price/function
     2. functions/circuit
     3. year

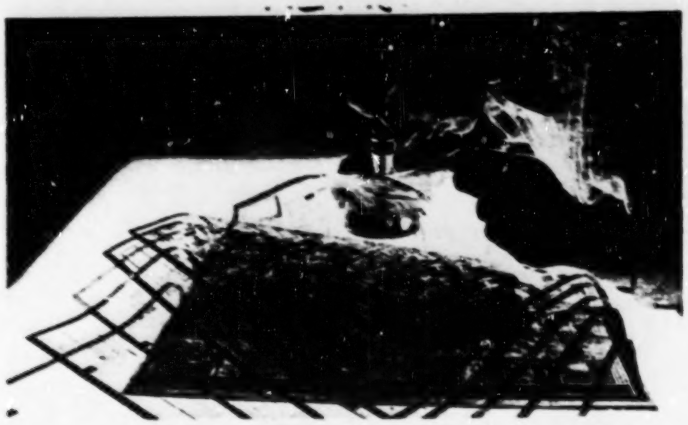

Figure 2. Checking Masks for the Production of Integrated Circuits at the Development Center for Integrated Circuits

Available to Others

The services of this development center set up in Ulm are not restricted to the company, but are also offered to small and medium-sized firms as neutral partners in handling questions on integrated circuits. For a fee, these firms can have the same problems worked through as the technical departments of AEG Telefunken. The employees of the Institute are obligated to treat research results confidentially even with regard to AEG Telefunken.

Besides the development center in Ulm, there are other facilities in the FRG which cooperate with industry in a similar manner, but more in an advisory fashion: The VDI Technology Center in Berlin and the Fraunhofer Institute for Solid State Engineering in Munich. The development center works closely with these institutes and with others in foreign countries.

Customer-Tailored Circuits

The development of integrated circuits pertains mostly to circuits designed to customer specifications, or customer-tailored circuits. Emphasis is on product developments which contain all steps from circuit development of beginning of production according to a schedule established by the customer. The essential tasks are developments for later, small production runs. Such products are usually of no interest to a semiconductor manufacturer, since his development potential would be tied to problems which in the final analysis do not fill his production capacity. The semiconductor manufacture is interested in the production, and not in the pure development of components. Nonetheless, for cost reasons of reliability or power consumption or size, for example, an integration is unavoidable. In these cases it will be advisable to assign this task to the development center.

The problems of small industry having no know-how and without any guarantee of large production runs had no opportunity to have customer-tailored circuits. Since the development center offers development aid without guarantee of production volume, one of the existing problems can now be solved.

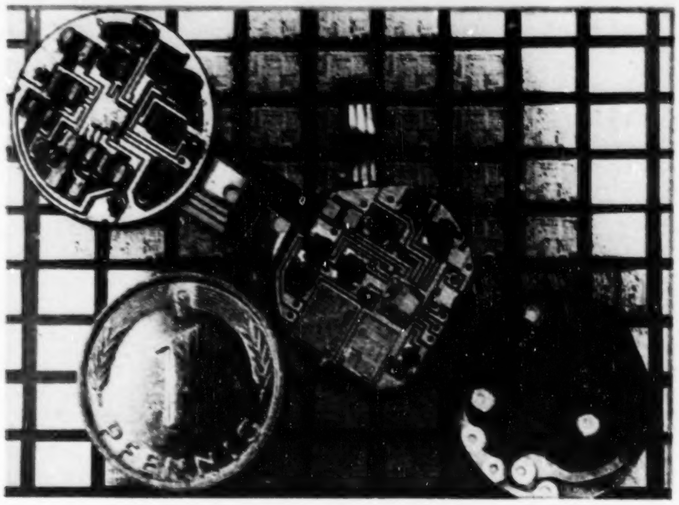

Figure 3. Highly-Integrated Miniaturized Radar System (Photo: AEG Telefunken)

Integration Required

A typical example which shows the necessity for integration of certain system developments, is a miniature radar system whose entire electronic system had to be housed on two modules of 16 mm diameter each (fiture 3). It consists essentially of two linear and two digital integrated circuits, the latter in a complex I^2L design with 4000 transistors. In connection with a sending transistor and a receiving diode, the device measures the distance to an object on the basis of the Doppler effect. The digital circuits contain memory, digital filter and an evaluation computer which determines the shortest distance to an object from the linear, highly-amplified reception signal, and gives off a signal to a high-current output at that time. System testing was only possible with the system completed and for reasons of space, an integration was unavoidable here.

9280
CSO: 3102/128

INCREASED GOVERNMENT FUNDING FOR MICROELECTRONICS

Dusseldorf VDI NACHRICHTEN in German 11 Dec 81 p 1

> [Text] Funding in the amount of DM 100 million will be spent in the coming year by the Federal Research Ministry within the frame of the special program in microelectronics. This money will be available for development of microelectronics in addition to the DM 136 million already approved. The VDI Technology Center in Berlin advised applicant companies of funds to be paid within the funding program.

In addition to an approximate 40 percent increase in funds for the development of microelectronics to DM 136 million, in 1982 another DM 100 million will be available from the Federal Research Ministry for the special funding program in microelectronics. As Federal Research Minister Andreas von Bulow acknowledged on 30 November, this program is intended to support primarily small and medium-sized companies in their competitive position and to secure jobs for the long term.

Product developments are promoted in companies of any size from all areas, from concept down to series-ready prototype. The workers at the VDI Technology Center in Berlin are occupied with the unfolding of the special program on microelectronics.

The future alignment of funds of the Federal Ministry for Research and Technology (BMFT) should be increasingly toward such technologies, according to von Bulow. Like microelectronics or biotechnology, these are key technologies which have positive effects on many sectors of industry. As the minister stressed, microelectronics would permit many solutions to urgent problems in the FRG of energy savings or pollution, for instance. The budget committee of Parliament took this into account by raising the budget for the BMFT for 1982 by 8.8 percent to DM 6.610 billion.

Additional funding of DM 280 million has been made available: DM 100 million for a special program on applied microelectronics, DM 150 million for iron and steel research, and DM 30 million for optic communications engineering. For energy research and technology, the forward projection budget was increased by 10.5 percent to DM 2.550 billion. Funds for non-nuclear energy research rose a surprising 22.7 percent to DM 761 billion [sic]. For nuclear energy research, DM 888 million and for energy research centers, DM 901 million has been set aside.

Von Bulow reported that he would undertake more intensive efforts to expand the innovation arsenal of the BMFT. The minister intends to dedicate particular attention to the problem of establishing innovative companies. This could mean chances for growth and jobs in future areas which would be too little used in the FRG. The translation of research results takes too long; we will have to be more effective here.

In general, von Bulow considers the development of new, overall strategies to be necessary to counter competition from the USA and Japan. It is important to develop new forms of cooperation between State, industry and workshop. State and business would have to cooperate pragmatically as in the USA or Japan.

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CSO: 3102/128

CURRENT WIND-ENERGY RESEARCH PROGRAMS REVIEWED

Brussels LA LIBRE BELGIQUE in French 5 Jan 82 p 14

[Article entitled "What is the Future of Wind-Energy?"]

[Excerpts] The firm HMZ (Hayen Maurice Zepperen), a family business located near St-Trond, has signed a contract for 1 billion with Wind Master Corporation of Carlstadt (New Jersey), for the manufacture and installation of 500 wind turbines with a power of 50 kW. In New Hampshire, windmills installed on farms are used to produce electricity. An all-new windmill has been designed for this purpose; it has a 20 meter wingspan.

This order is quite exceptional because it exploits a technology developed here in the domain of new energy sources, it also reveals the growing interest demonstrated in windmills throughout the world. In the present article, we propose to review some innovations in this field, and to outline the future of wind energy.

In the Garden of the Boss

The HMZ enterprise, which until recently manufactured agricultural machinery and farming equipment, converted to solar energy after a group of students from the Katholieke Industriele Hogeschool van Limburg had devoted a senior project to wind turbines. Two engineers who had participated in this project were hired by HMZ and got to work. After a while they built a prototype which was installed in the garden of their boss, Jos Hayen, and which provided power to heat his house.

The HMZ windmill obtains 46 percent of its power from the wind, while the competition averages only 30 to 40 percent. This higher yield is due to the wings, whose design is quite special since it makes use of the lift phenomenon which is so well-known in aviation: it involves the vacuum created behind an airplane wing.

The HMZ prototype produces 7.5 kW for a wind velocity of 7 meters per second. It is thus adapted to the Limbourg climate, where wind speeds are low. For the time being, the prototype is connected to storage water heaters in which power is converted to heat (95 degrees maximum) by means of resistors. The windmill offered by HMZ costs less than 450,000 francs.

One of the HMZ projects is a 150 kW turbine which will operate at the top of a 34-meter tower, and which is scheduled to be completed next year. Other, bolder projects in the works include another turbine, 85-meters high, whose construction is scheduled for 1984/85.

Zepperen is receiving an abundance of orders, and a new plant is under construction at the St-Trond industrial park; it will cost 85 million. The company's 1980 turnover was 270 million francs. Fifty employees were hired to join the 120 existing workers.

What is the situation with our northern neighbors? Actually it is rather disappointing for a country which, after all, has made the best possible use of windmills for a very long time.

In Zeeland, near the Belgian border, the regional electric power company, Pzem, which also owns the country's only nuclear power plant (477 megawatts), recently opened the first wind-power plant to supply electricity to the public network. Supported on an 18-meter pole, three 7-meter blades provide 55 kW with a wind of 5 meters per second. It is barely more than a pinwheel, whose output can service only some 50 dwellings.

Few other wind-power installations have been installed. On Terschelling Island (at the extreme north of the country), the Ecole Superieure de Navigation is operating a wind generator underwritten by the Common Market. South of Rotterdam, a harbor enterprise is using another windmill identical with the one in Zeeland.

One symbol of this dearth is without doubt the Petten wind generator, shackled by administrative paralysis. Its two 12.5-meter propellers should provide not only 300 kW, but also a wealth of figures on the characteristics of such an installation. But although its construction was decided in 1976, and even though it has already been run clandestinely, its placement in operation has been constantly postponed: its file has broken down somewhere between three ministries with "appropriate jurisdiction."

One can imagine the disappointment of the Dutch when faced with this shortage, as well as when they realize that the only wind-power stations offered on their market are manufactured in Denmark. A national conference organized recently about the prospects for this form of energy turned into a confrontation. As a result, and without any implied promises to the industry, the Dutch government estimates that by the year 2000, the wind will supply the Netherlands with 1500 to 2500 electric power megawatts, which is equivalent to the production of two nuclear plants.

Like the Cologne Cathedral

In West Germany, the first stone for a wind-power installation was laid in Schleswig-Holstein. It has been named Growian, an acronym for "grosse windenergianlage," which in French would be Grineo, for "grande installation eolienne" (large wind-power installation). It involves a construction with a height of 150 meters, capable of competing with the Cologne Cathedral. Installed at this height will be a rotor consisting of two 50-meter long blades. This rotor will begin to turn when the wind velocity reaches strength four, driving a generator located at the top of the tower. This installation, which should become operational in the fall of 1982, will have a power of 3 megawatts. Built with the support of the Federal Ministry for Scientific Research, it should cost 70 million DM.

In order to cover all the energy needs of FRG from wind sources, 25,000 such installations would have to be erected throughout the country!

The discussion on whether to utilize wind energy began several years ago in Germany. The north of the country, swept by winds the year round, has an inexaustible supply, but even today, the discussion between the supporters and detractors of this natural energy continues, especially about the profitability of the necessary investments.

In 1973, experts had made preliminary calculations, and had concluded that the electric power derived from wind could be used for local heating. And while it is technically possible to integrate wind-generated power into the public network, the Germans believe that this is not yet economically efficient.

But this is not the goal of the Schleswig-Holstein experiment. The wind will remain a supplementary energy.

The Musgrove Machine

In England, the experts are more optimistic and in fact more advanced in their research. They estimate that one day wind energy should be able to supply up to 20 percent of the country's electricity needs, while also satisfying the electric power needs of small communities in many areas of the world.

Four British enterprises have thus joined forces in 1980 to perfect a new model. This group has received a 400,000 pound subsidy from the British government to undertake a study for the construction of a wind-power generator with a diameter of 25 meters, which will provide 130 kW. This installation will serve as a test bench for larger machines which are expected to be built later. These could have a diameter of 100 meters and a power of several megawatts.

The 25-meter prototype will be based on a turbine with a vertical axis and variable geometry, invented in 1975 by Peter Musgrove of Reading University, near London. He has already built machines of three and six meters in diameter, and will serve as consultant for the new project. As recognized expert and president of the British Wind Energy Association, he is also advising China on its wind energy program, at the request of the United Nations.

The Musgrove machine has vertical blades mounted at each end of an arm rotating horizontally on a vertical axis installed at the top of a concrete tower. Microcomputers will automatically regulate the blade angles as a function of the wind's variable force, so that the power generated will remain constant.

The prototype of this newly designed wind generator, which is already operating at Brembridge Fort, on the Isle of Wight, has a diameter of 6 meters and produces about 30 kW.

One of the characteristics of the 25-meter wind generator is that its turbine will be equipped with rotor blades made of composite materials, such as carbon or glass fibers. This gives them a life expectancy of 40 years, which is an appreciable advantage for systems expected to be installed offshore in groups of several units. Current plans envisage the location of these groups sufficiently far away to avoid esthetic infringements on the environment, and their connection to the national electric power distribution network.

According to the British company Aircraft Designs Ltd., a collaboration could be envisaged for the industrial production of this type of wind generators in the next few years together with Belgian aeronautics companies, among which SONACA, which already has an advanced experience in the production of composite materials.

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FURTHER TESTING OF COAL CONVERSION PROCESS UNDER WAY

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 14 Jan 82 p 7

[Text] The United Electrical Generating Works of Westphalia AG (VEW) has now begun the second stage of testing of its coal conversion process, after having received approval for a DM 65 million grant from the Federal Ministry for Research. The planned coal gasification experimental plant, with a capacity for partial gasification of 10 tons of coal per hour, should go on line in 1984 at the Gersteinwerk powerplant in Werne-Stockum. Plans are to link the new installation, which will cost DM 130 million, into the powerplant process. The gas produced, as well as the coke by-product will be utilized as fuel in a 107 megawatt block.

The coal conversion process has been developed by VEW with the intention of converting coal to electrical energy in the most cost-efficient and ecologically defensible manner possible. The technical resolution of this problem has been demonstrated in the course of experimental operations over the past 3-1/2 years, using an installation with an hourly capacity of 1 ton of coal. The successor project will require a substantial technological outlay, for example, a complete gas purification that will reduce discharge emissions to the legally prescribed minimum. VEW expects to gain further positive results from the second experimental plant by 1985, so that the next stage, the erection of a plant with a 60 ton/h capacity can be projected. This unit is planned for hook-up to the 750 megawatt composite block now under construction at the Gerstein works.

VEW disclosed further that it has submitted a new application to the Land authorities in Duesseldorf for approval of the 1,300 megawatt light water reactor at Hamm and thereby reactivated plans for the project which were submitted in Duesseldorf as early as 1975. In addition, VEW expects construction approval from the Lower Saxony Land authorities for the first section of the block in Lingen by the spring of 1982.

VEW's chairman, Professor Klaus Knizia, expressed particular satisfaction at the federal government's recommendation, contained in the third renewal of its energy program, that additional nuclear powerplants, past those already on line or under construction, should be undertaken where required. The federal government's current awareness that nuclear energy must continue to make an even greater contribution to electrical supply production has been urged by electricity producers for more than 10 years. Without cost-efficient nuclear energy the raw material industry in the eastern Ruhr district would be continually and seriously weakened.

9878
CSO: 3102/131

WINKLER FLUIDIZED BED GASIFICATION TO ENHANCE COAL

Duesseldorf VDI NACHRICHTEN in German 18 Dec 81 p 1

[Text] As an alternative to oil as a raw material, the Rhenish Lignite AG (Rheinbraun) of Cologne, wants to demonstrate that the gasification of lignite on a large scale "can be a decisive step forward toward the enhancement of coal." This was the statement of Dr-Ing Peter Speich, member of the firm's board responsible for research and lignite enhancement, at the start of construction work for a synthesis gas plant in the Rhenish lignice area. The site at Berrenrath, southwest of Cologne, was chosen because it is located within a large and compact energy raw material reservation and because lignite's chemical and physical properties are especially suited to enhancement.

The first section of the pilot plant, which will employ the Winkler high-temperature process, was begun at this time after having accumulated experience since 1978 with a smaller 3t/h pilot plant. It is expected that, from 1984 on, some 37,000 m^3/h of synthesis gas will be obtained from a lignite input of 55t/h. A second construction phase, with 3 gasification reactors and appropriate processing installations, which will go on-line in 1988, should raise plant capacity by some 110,000 m^3/h of synthesis gas. By that time a gas plant, in which some DM 600 million will have been invested, will have been created, capable of producing approximately 1 billion cubic meters of synthesis gas, which will be transported over pipelines to existing plants of Union Rhenish Lignite Fuels AG in Wesseling, a branch of Rheinbraun, thereby replacing some half-million tons of oil.

Synthesis gas is a mixture of carbon monoxide and hydrogen, which the chemical industry uses as a raw material. Methanol and ammonia can be produced from it and it is also used in ore reduction. The gas from Berrenrath will primarily be processed into methanol, which can be used to power motor vehicles. The plant, when completed, will have a capacity capable of replacing some annual 200,000 tons of motor fuel.

For the operation of the Berrenrath gas plant, which will be designed and built by the Uhde firm of Dortmund, Rheinbraun will be able to make use of existing components of a briquet plant on the site. This includes preparation and drying facilities as well as the steam and electrical generating facilities for a mine powerplant. A gasifier will replace the briquet press. An enclosed industrial development site is also located there.

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BRIEFS

COAL GASIFICATION IN ITALY--A pilot coal gasification plant in Italy is planned by the firms of Nuovo Pignone and Franco Tosi Industriale, both members of the ENI-Group. The plant is intended to produce medium caloric gas on an industrial scale from Sicilian coal. A cooperation agreement was signed between the two firms, providing for the production of gasification and recycling boilers. The high sulfur content of Sicilian coal is expected to prove problematic. [Text] [Graefelfing ENERGIE in German Nov 81 p 344] 9878

CSO: 3102/131

MEETING HELD TO DISCUSS IMPROVING TECHNOLOGICAL COOPERATION

Oslo AFTENPOSTEN in Norwegian 10 Nov 81 p 31

[Text] In spite of a series of meetings resulting in declarations of intent, it looks as if both industrial and research cooperation between Norway and West Germany are in the doldrums. The West German industrial leader Rudolf von Bennigsen-Foerder recently expressed the opinion that industrial cooperation between Norway and West Germany was sluggish and going badly. As for research and development, it seems as if the meetings in Trondheim over the weekend between Industry Minister Jens-Halvard Bratz and Andreas von Buelow, who is director of the Department of Research and Technology, have yielded no concrete results.

In a press release from the meeting it was said that the two ministers have continued the discussions on German-Norwegian technological cooperation. The ministers examined status reports on current projects and discussed forms of continued cooperation.

Neither of the two ministers, however, could comment further in a press conference Monday on which firms would take part in research cooperation. Both sides also seem uncertain about how much money should be invested in this area.

Minister Bratz emphasized that in this work one must consider the so-called umbrella effects that would spread out the effects as much as possible to smaller firms.

The two ministers agreed Sunday that further cooperation should be developed in the following three areas: recent types of steel and their use in offshore work, biotechnology, and research in working conditions.

The West German technology minister said that there are special interest in taking advantage of the experience Norway could offer research on working conditions. The German side also had a good bit to contribute, he said. He emphasized here the importance of being able to include the trade unions in this work.

Minister von Buelow also said that he has invited Industry Minister Bratz for a reciprocal visit to West Germany.

9124
CSO: 3102/94

REORGANIZATION OF MINISTRY OF RESEARCH, TECHNOLOGY

Paris LE NOUVEL ECONOMISTE in French 4 Dec 81 p 4

[Article by Gilles Coville. "The Chevenement Organization Chart"]

[Text] The new organization of the Ministry of Research and Technology (MRT), which has just been presented by Jean-Pierre Chevenement, is a preliminary to another fundamental reform. the regionalization of the execution of scientific policy. For industrialists, this second aspect will undoubtedly be much more important. For the time being, Mr Chevenement is doing business "at the house of methodical doubt" in the old Ecole Polytechnique, rue Descartes, attempting to match together the jigsaw puzzle which he has been handed: DGRST (General Delegation for Scientific and Technical Research), DIT (Directorate for Innovation and Technology, formerly attached to the Ministry of Industry), and Midist (Interministerial Mission for Scientific and Technical Information).

At the beginning of next year, MRT will revolve around two poles: a Directorate for General Policy, responsible for major orientations (plan, program-laws), budget projects, and guidance of research organs; and a Directorate for Scientific and Technologic Development and for Innovation, which assures the effective execution of the policy, and is therefore more concerned with enterprises. The first directorate has been placed in the hands of Jean-Francois Thery, 47 years old, master of requests at the Council of State: researchers will deal primarily with him. The second directorate has been entrusted to a man who is well-known to information processing and oil industrialists: Maurice Allegre, 48 years old, chief engineer at the Ministry of Mines, delegated to information processing from 1968 to 1974, and until recently deputy general director at the French Oil Institute. Mr Allegre will control the purse strings for assistance and credit to industry: he is assuming responsibility for innovation and research funds, and for the guidance of Anvar, he will also represent the ministry in Codis (Orientation Committee for the Development of Strategic Industries) revised and modified by the socialist government. These two directorates will receive support from two other teams: a service for international affairs, led by a diplomat (Jacques Warin), and a scientific and technical mission, directed by a physicist (Yves Farge). Midist remains directly attached to the minister, who is also creating as an adjunct to his cabinet a "center for forecasts and evaluation," entrusted to Thierry Gaudin. As a second phase in the reorganization of MRT, regionalization will occur only progressively, beginning in 1982. The basic idea is to have in each region a representative of the ministry, who will act as liaison with industrialists, laboratories, public organs, banks which finance innovation, and the regional public establishment. Qualified persons for these positions remain to be found.

And finally, Mr Chevenement seems to expect a great deal from the regional advisory committees which are being created right now in the wake of the meetings of research establishments that have been held almost everywhere in France. What will be the real power and structures of these small parliaments of research and technology? For the time being, their promoters are being given free rein. But eventually, these seething initiatives can profoundly change the usual networks of relations among industrialists, researchers, financial supporters, and public powers.

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CSO: 3102/108

SCIENCE POLICY

BRIEFS

ANVAR BUDGET INCREASE--In 1982, the intervention budget of ANVAR (National Agency for the Valorization of Research) will amount to 760 million F of program authorizations, of which 720 are allocated for innovation assistance, and 40 for innovation bonuses. The 720 million F included in the budget draft are to be compared to the 420 million F included in the initial finance law for 1981; thanks to the 1980 reports and to the 1981 budget correction law (+60 million F), ANVAR will be able to allocate between 600 and 650 million F in 1982. Innovation bonuses in 1982 will reach 40 million F (compared to 30 million F in 1981). They consist of a lump sum payment equal to 25 percent of the research work subcontracted by small and medium enterprises to approved laboratories. And finally, the state budget contribution to ANVAR's operations will be 67 million F (compared to 49 million F in 1981), which implies the creation of 22 new positions in the Paris region, and the confirmation of the decisions taken in the budget correction law concerning employment matters: 54 positions, of which 32 are to be made permanent and 22 are newly created. [Text] [Paris CHIMIE ACTUALITES in French 4 Dec 81 p 4]
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CSO: 3102/108

CIVIL AIRCRAFT BUILDERS LOOK TO COMPOSITES

Duesseldorf VDI NACHRICHTEN in German 4 Dec 81 p 11

[Article by Horst Rademacher: "Commercial Aviation Steering To Plastics. Carbon Fiber-Reinforced Plastics To Replace Metal In Elevator And Tail Assemblies"]

> [Text] Plastic components have become a permanent part of the cabin in commercial aircraft. Every passenger uses the folding table fixed to the back of the seat in front of him or the plastic storage compartment above his seat--both of them components whose failure would pose no immediate danger for the aircraft. Yet the primary surfaces of an aircraft are still generally assumed to be constructed of aluminum. But design programs for elevator and tail assemblies are already working toward the complete construction of these elements from reinforced plastics.

Cautious estimates of European aircraft manufacturers estimate the percentage of plastics in airframes at some 50 percent by the year 1990. By the turn of the century the first aircraft fully constructed of plastics could be in operation--perhaps even earlier in the US. The gradual introduction of modern construction materials in civil aviation is looking like a quiet revolution.

A part of this revolution has already been in flight for several months on a Lufthansa Airbus A 300. The aircraft was equipped for experimental purposes with a rudder which was completely constructed of composite fiber materials (FVW)--except for an aluminum lightning arrester strip. The roughly 8 meter long component is some 40 kg lighter than a similar rudder built of metal. This means the equivalent of an 18 percent savings in weight. According to current inspection reports it can withstand stress just as well as its metal cousin.

Granted that the rudder is not the first component that has replaced metal structures on Airbus-aircraft, but it is by far the most important to date. As early as 1979 floor beams of carbon fiber-reinforced plastic were experimentally installed. These beams carry the stresses from the pressurized cabin to the supporting members of the fuselage.

In August 1979 a further step was taken in experimentation, when the nose of the rudder assembly, i.e. the forward section of the fin in the axis of flight, was produced from carbon fiber-reinforced plastic (CFK). Just recently work began at

Einswarden plant of the United Aeronautics Works on assembly line production of CFK-spoilers for the wings of the A 310 Airbus model (s. VDI NACHRICHTEN 46/81). On the basis of present orders some 900 such spoilers are to be built at Einswarden. What are being built are parts of the aircraft's secondary structure, previously manufactured from composite materials, whose failure poses no immediate hazard for the aircraft.

A portion of the research, development and experimentation activities for CFK components of the Airbus is being carried out by Messerschmidt-Boelkow-Blohm (MBB) at Hamburg. Dieter Schulz, head of its structural mechanics section, explained the goal, "We are looking to get a complete rudder assembly for the Airbus models A 300 and A 319 ready for assembly line production." The most telling argument for why the European Airbus industry is interested in FVW is the reduction of direct operating costs, to be understood as fuel costs.

CFK-produced components can produce a reduction in weight of between 20 and 30 percent as against the same components manufactured from metal. Compared to the already familiar glass fiber-reinforced plastics the saving in weight is somewhat less than 20 percent. The specific weight for GFK materials is measured at 1.8 g/cm^3 and for CFK at 1.5 g/cm^3.

But there are still other reasons that justify the very extensive research program in the field of CFK's being undertaken by the MBB plant in the Hamburg harbor. Said Dieter Schulz, "The rigidity of CFK materials is substantially greater than that of GFK." The two materials differ from each other in their elasticity module by about a factor of 4.

The entineers were obliged to strike compromises in the execution of their substitution concepts. It was not just a matter of attaining a maximum weight reduction, but also at the same time of developing cost-effective production processes. MBB has had experience with FVW in military aircraft ever since 1965. This made the choice of material substantially easier and had allowed the testing of a number of fabrication methods. The choice finally fell on carbon fibers of the type KC 20 and epoxy resins which hardened at about 120°, while the resins employed on military aircraft only hardened at a higher 180° because of the greater demands for temperature resistance.

The rudder is constructed in a sandwich-plate configuration, whereby glass- and aramide-fibers are also employed along with the carbon fibers. The individual panels can be produced almost automatically in modular construction fashion, once they reach the stage of assembly line production.

In addition to the basic properties of the CFK components other material-specific problems involved in their use in aircraft surfaced--solutions which will require heavy research outlay. The major problem associated with FVM use in aircraft is humidity, which, especially in tropical countries, is absorbed by the material. Under poor climatic conditions the degree of humidity can even be measured as a percentage of total weight.

For approval of the components it will be necessary that the elastic parameters of the materials remain within the required tolerances even beyond broad temperature ranges and various degrees of humidity. To test this for the large rudder of an

Airbus, a new climate chamber had to be built especially for this purpose at Hamburg. The largest deviations among the individual material properties were found in the elasticity module, when it was measured diagonally to the axis of the fibers. The module, when compared to dry conditions at 20°, decreases by some 40 percent in a damp atmosphere heated to 70° C.

The tail and the rudder assembly nose should be, by 1983, in full production for use on the smaller Airbus A 310. Since these are of the same construction as those on the A 300, there is nothing to impede their introduction on this aircraft as well. The development of the entire tail assembly, i.e. the entire tailplane body, will not be complete until that time. Dieter Schulz expects that the complete tail assembly will be the first section of the primary structure to be totally constructed of FVW.

The next step with the Airbus will then be an elevator unit of FVW. It is not yet anticipated that this can be installed on the A 320, but only on the type to follow this. The step toward its development is not a very large one after the experience gained with the rudder assembly.

The development program for the tail assembly, including testing, is estimated at 47 million marks, of which the Federal Ministry for Research will put up a large part. Experts believe, however, that for the development of a fuselage and the construction of wings from FVW, a suplementary research program will be required.

Airbus-Industry is, of course, not alone in wanting the introduction of FVW. In the Federal Republic, Dornier, along with MBB, is also working with CFK and, in the United States, NASA has also begun research programs for tail and elevator assemblies of FVW. Such structures have already been flown experimentally on large-scale jets (DC 10, Tri-Star).

A program for the development of fuselage components of FVW will begin in the near future in the United States. The United States is of course several years ahead of Germany in this sector but European aircraft manufacturers hope to be able to shorten the lead by intensive cooperation.

9878
CSO: 3102/126

SAAB DEVELOPS FIRST NONASBESTOS BRAKES FOR 1982 MODELS

Oslo ARBEIDERBLADET in Norwegian 26 Nov 81 p 26

[Text] In the year 1982 Saab will go over to completely nonasbestos brake pads on all models. The Swedish pioneer automobile firm is the first in the world in this field as well. The development of the new brake pads has taken 5 years.

The pads that the Saabs will receive next year will not only contribute to a better environment in the factory, the workplace, and on the road, but increased durability will mean that replacement intervals can be increased up to 300 percent.

"We begun as early as 1976 to investigate alternative solutions to the conventional brake pads that contain asbestos," Sven-Ake Grahn said. He is responsible for the development of the brake systems in the factory in Trollhattan. The most important reason was that turbo models were to be mass produced.

At a top speed of more than 200 kilometers an hour, there is a special demand on the brakes, both in quality and in durability.

It was relatively simple to replace the outer forward brake pads with pads of a completely new type--a special semimetallic pad that contains no asbetos. On the other hand, it was difficult to replace the asbestos in the other brake pads of the car. Grahn says that only now have they been able to introduce completely nonasbestos brake pads.

One cannot simply select any sort of brake pad. The pad has one of the toughest jobs in the car. It must function both in warm and cold temperatures and have the same qualities on dry and wet surfaces, with and without a load. The pad must retain its qualities in the smallest detail.

These various demands are difficult to attain because there are pads on both sides of the brake disc, and both pads are exposed in differing degrees to cold air and moisture. The picture is complicated greatly by the fact that the forward brake pads are also worn more quickly than the back ones because of greater load.

Sven-Ake Grahn says that the factory has found a solution based on the use of semimetallic inner and outer pads on the forward brakes and organic asbestos-free ones in back. Both types are completely nonasbestos and deliver exactly the braking qualities needed at various speeds and under varying driving conditions. And on top of this, they have a very long life. The average driver can plan on driving between 70,000 and 90,000 kilometers before having to replace the brake pads.

9124
CSO: 3102/94

INTERNATIONAL HIGH-SPEED-TRAIN CONNECTION UNDER DISCUSSION

Duesseldorf VDI NACHRICHTEN in German 11 Dec 81 p 7

[Article by Paul Kalinowski: "Magnetic Railroad Route Frankfurt-Paris Under Discussion"]

> [Text] Trains travelling at a speed of between 300 km/hour and 500 km/hour are to link the centers of the European Community. It is not yet certain whether they will run on electromagnetic tracks or use the wheel-on-rail system. There is also no plan for European transportation in existence. This emerged from a seminar held by the German Society for Transportation Policy in Kassel.

"Rail Systems for Long-Distance Transportation" was the theme of a two-day seminar in Kassel. No fewer than 25 speakers, experts in innovative wheel-on-rail (R/S) projects and electromagnetic systems (EMS) gave a "self-contemplative view of what has been achieved in the area of new high-speed rail systems for speeds up to 500 km/hour and how matters will continue. The organizers, the German Society for Transportation Policy (DVWG), had given themselves no easy task in presenting all aspects of the "project of the century." Optimists and sceptics alike had their turn; technicians, economists, lawyers and politicians.

Since these enormous projects only make sense when they are carried out beyond national borders, the horizons of transportation policy were also illuminated, from a German and French perspective. The conclusion was: for the foreseeable future no one is thinking in terms of a European plan for high-speed railroads, such as unified, common transportation. There are also no far-reaching transportation policy goals for passenger transportation. The range of vision currently does not extend beyond 6 months. But new railroad systems require long-range vision extending beyond the year 2000. European dimensions are needed if the projects are to be given any chances of being carried out. The requisitions for the new high-performance, high-speed railroads also depend on how their range of use is located between traditional railroads and air traffic.

Figures on the expenditures for railroad technology research give some insight into the Ministry for Research and Technology's research and development program for railroads. Until 1980, DM 675 million had been spent. Between 1981 and 1984 an additional DM 115 million will be available annually. Although R/S research will be continued (one-third of the research funds), the majority of the measures to give subsidies are in the magnetic railroad sector. In the technical-economic part of the seminar it became clear that it is primarily in the roadbeds that problems in design and construction still remain to be solved if they are to be travelled on at speeds of 300 km/hour to 500 km/hour. No serious difficulties are expected with the vehicles. Their share of the investment structure is small, and there is past construction experience to fall back on.

The big question, which will probably remain unanswered for a long time, is whether future high-speed railroads are to run with the traditional wheels on rails or with "magnetic wheels." In presenting the technical possibilities for both high-speed rail systems, the guests from France laid down the trump cards with the results of their newest generation for passenger transportation, the "High-Speed Train (TGV)." For them there is no doubt that speeds up to 400 km/hour can be reached with the classical R/S system, and no new infrastructure for high-speed railroads is required. There would also be no difficulty in picking up current, as the 380 km/hour record run demonstrated. These were the findings concerning friction between wheel and rail: "Under all circumstances a grip of 10 percent at 300 km/hour and of more than 6 percent at 450 km/hour can be expected."

Those in favor of the magnetic rail system and of the wheel-on-rail system presented impressive research results. At the end of the coming year the 20.6-km-long Transrapid test facility at Emsland (TVE) will be completed, on which the magnetic railroad will be tested as a complete system. These are the overriding design criteria: Time of use each day, 18 hours; -25°C and +40°C; wind, 25 ms/sec, normal levels of precipitation, noise level 53 dBA at 25 meters and 65 dBA at 1 meter, 60 dBA inside the vehicle. Maximum acceleration levels are: longitudinal 1.5 ms/sec^2, lateral 1.0 ms/sec^2, vertical 1.0 ms/sec^2.

Japanese experiences concerning the use of high-speed trains came up for discussion. It is unarguable that the high-speed train services have been exceptionally well received by the Japanese market. On the other hand, the other services of Japanese Railroads (JNR) show serious declines. In spite of the profits of the high-speed trains, particularly of the Shinkansen trains, the JNR's debt continues to climb (converted at current rates it is DM 80 billion). Further expansion of high-speed routes is now in question in Japan.

A study of planning processes and the public introduced a sour note into the designs of the high-speed rail planners. It showed what difficulties can be expected in constructing high-speed rail systems. All the participants agreed that high-speed rail links have to be created between the countries of the European Community, if the countries on the periphery are not to be allowed to waste away. But opinions are still sharply divided about how this is to be done. Case studies for comparisons of systems on the 560-km model route between Frankfurt and Paris are expected to clarify matters. The basis for the EMS is a traffic load of 3.3 million passenger kilometers per kilometer of the network per year. The cost: about DM 17 billion. The studies for the EMS corridor Frankfurt-Kaiserslautern-Saarbruecken-Metz-Reims-Paris should be transferable to the Cologne-Frankfurt and Frankfurt-Munich stretches.

9581
CSO: 3102/124

FUNDS RESTORED FOR WHEEL-ON-RAIL RESEARCH

Duesseldorf VDI NACHRICHTEN in German 4 Dec 81 p 1

[Article by Ralf Roman Rossberg: "The Railroad To Pick Up Speed. Wheel-Rail Research To Continue--Magnetic Rail Experimental Facility To Keep Its Lead"]

> [Text] The support for the planned wheel-on-rail experimental track Rheine-Spelle-Freren in Lower Saxony, scheduled to be put in abeyance this fall, will be continued. After a recent announcement of support by the Federal Ministry of Research and Technologie, continuation of its construction is assured, if the first section of the experimental magnetic track in the Emsland can be completed as scheduled in 1983. Until then only funds for right-of-way stabilization are available.

The German Federal Railroad (DB), which does not include research projects within its competence, regards the decision as decisive for the future. Its goal is to optimize the railroad system as a whole; to reduce deterioration, energy needs and environmental impact to a minimum; to make appropriate investment decisions with respect to its projected longevity and later to be able to make the requisite comparisons with the magnetic rail system.

The president of the Federal Railroad's central office at Munich, Theo Rahn, stated during an on-site visit, that the Federal Railroad could, like the French national railroad, reach speeds of 260 km/h safely even now, if the appropriate stretches of track were available. Even in France the presently available technology could be and, in fact, must be substantially improved. This is a decisive factor for wheel-track research in the Federal Republic.

Part of this research is being undertaken at the dynamometer facility at Munich-Friemann using simulation models in place. Confirmation of the results obtained there is not possible on an existing nor on any of the planned new stretches, but only on an experimental stretch that is full equipped with all test facilities.

The test and most easily attainable solution within the near future would be an expansion of the 22.7 km Federal Railroad stretch Rheine-Spelle-Freren for experimental runs of up to 350 km/h speeds. For some 6 km, the right-of-way is already capable of such forces. Another 4 km long stretch which did not require right-of-way stabilization has already been prepared for trackbed and superstructure to meet the requirements of the experiments. Planning, acquisition of right-of-way and construction materials have already cost an investment of some DM 20 million. The Ministry of Research and Technology had already approved expenditure of DM 108 million, when the tense federal budget situation led to the total elimination of funding for the experimental track. In the meantime, sufficient funds to complete at least the stabilization of the right-of-way have been approved. The magnetic track project on the other hand, will require an annual expenditure by the Federal Railroad of 60 to 70 million marks until 1985.

For a distance of almost 23 km the Federal Railroad track stretch Rheine-Spelle-Freren cuts through the flatlands of Lower Saxony. The track, which is now used by only a few freight trains, is to be extended for high speed experiments of up to 350 km/h. The recently cancelled funding for its construction is now assured until 1983. Some DM 20 million have already been invested in concrete sleeper construction--as seen in the photo.

9878
CSO: 3102/127

TRANSPORTATION

RESEARCH, PLANNING COMPANY FOR MAGNETIC RESEARCH FOUNDED

Duesseldorf VDI NACHRICHTEN in German 4 Dec 81 p 2

[Article: "Joint Magnetic Track Project With Railroad And Lufthansa. Experimentation And Planning Company Founded"]

[Text] At the end of November in Munich the Research and Planning Company for Magnetic Track Systems was founded. Among its shareholders are the German Federal Railroad, the German Lufthansa and the Ottobrunn Industrial Engineering Company (IABG) of Munich.

The primary task of the new company will be the operation of the experimental magnetic track installation in the Emsland, currently under construction, with a first section of track scheduled for completion in 1983, as well as evaluation of the magnetic track from the perspective of potential users; studies of the user acceptance of such a system, exploration of potential applications and, finally, the dismantling of the stretch from its right-of-way after 10 years.

In line with this the activity of the new company is, for the moment, limited to the next 10 years. Within this period it is expected that some 140 million marks will be made available by the Federal Ministry for Research and Technology according to present plans; of the annual allocations, some DM 10 million are scheduled for experimentation and the other DM 4 million for other expenses.

The Magnetic Track-Transrapid consortium, which is responsible for the planning and construction of the magnetic track system with the Emsland experiment station, will continue to exist. The division of responsibilities between the two entities still remains to be clarified in detail, though basically the new company will be responsible more for questions related to its application and the Transrapid Consortium with questions of further technical development.

The German Federal Railroad, which has figured to date more as an attentive observer of the magnetic track activities, is, by its participation in the research and planning company, documenting its claim to the management of an unconventional long-distance transportation system within its bailiwick. Nonetheless, there are at the moment no signs of this evident either in domestic or European traffic.

9878
CSO: 3102/127

FUEL-SAVING PROPELLER UNDERGOES TESTING AT DORNIER

Duesseldorf VDI NACHRICHTEN in German 11 Dec 81 p 4

[Article by Erhard Heckmann: "Economical Propeller Undergoes Testing"]

[Test] Rising fuel costs have reawakened interest in propeller-driven aircraft. Different goals are emerging in research and development in this area worldwide. In the United States work has concentrated on increasing maximum speed, which is to be raised from Mach 0.75 to Mach 0.80. The American government is giving $200 million to support this work through NASA, which is to be spent just for the development of new types of propeller. One need only recall the four-blade "scimitar" propeller, with its sharp offset and curved axis. Work on critical integration problems, such as the behavior of the engine air intake airflow, problems involving the combination of sweptback wings and propeller engines and vibration stress on the aircraft fuselage has not been excluded.

In Great Britain propeller development is taking another direction, to be precise, the search for a new type of propeller which is to be the successor to the highly successful Rolls-Royce Dart turboprop (1,000 kW). It was announced recently that British Aerospace Dynamics is testing propellers with from six to eight blades in the wind tunnel with this goal in mind.

The USSR tested an eight-blade propeller in an Antonov 24 transport aircraft for an output of 3,000 kW at a speed of 1,245 revs/min.

In the FRG efforts are being directed at a different area of application--general aviation. In Oberpfaffenhofen at the beginning of October, flight testing began of a new propeller for twin-engined aircraft with engine developing about 550 kW. Development is being carried out as part of the Civilian Component Program (ZKP) of the Ministry for Research and Technology (BMFT), under the direction of Dornier and in cooperation with the Hoffmann propeller works in Rosenheim, the German Air and Space Travel Research and Test Institute (DFVLR) and the Technical University of Stuttgart.

Since conventional propellers attain only about 50 to 70 percent of maximum thrust when the aircraft is stationary and 90 percent in level flight, estimates are that considerable improvements in thrust during takeoff and the ensuing climb can be achieved (from 18 percent at rest and between 4 and 6 percent while climbing). The new propeller will result not only in a reduction of noise but also in a reduction of fuel consumption of about 5 percent. The original Hartzell propeller from the TNT test aircraft (TNT stands for New Technology Wing) is being used as the starting and reference point. For the new propeller newly developed profiles were used with better lift-drag ratios at high lift coefficients and without negative pressure areas in the design. The blade planform and the radial twist were optimized to achieve better distributions of lift coefficient, flow and induced axial velocity. The two propeller designs that resulted from this work differ only in the sweep of the blade tip.

For the testing now taking place the conventional Hartzell propeller is on the right-hand engine and the new TNT propeller is on the left-hand engine. There are plans to equip the Dornier Commuter/Utility 228 series with this new propeller after testing and certification have been completed. On the basis of the experience gathered, there is a possibility of developing propellers for other categories of aircraft and putting them into production in the German aircraft industry.

9581
CSO: 3102/125

BRIEFS

ATR 42 PROJECT BEGINS--On 7 November Aerospatiale in France and Aeritalia in Italy signed an agreement which contains the official start of the program for the new short-range and commuter passenger aircraft ATR 42. The ATR 42 is a shoulder-wing design with a T-form tailplane for 42 to 49 passengers, powered by two turbo-prop engines. The new short-range aircraft is designed for routes with a maximum length of 1,300 km. Powered by two Pratt & Whitney of Canada PW 100/2 engines, each developing 1,658 kW (2,200 shaft horsepower), the ATR 42 is expected to reach a maximum speed of 510 km/hour. Maximum takeoff weight is given as 14,510 kg. Maximum weight without fuel (MZFW) is quoted as 13,780 kg, empty weight with equipment as 9,062 kg. Maximum fuel load is 4,500 kg. In its base version the ATR 42 will have a length of 22.7 ms, a wingspan of 24.57 ms and a height of 6.45 ms. With a load-bearing surface of 54 m^2 the maximum surface load is 269 kg/m^2. The ATR 42, with which France and Italy want to secure their share of the commuter market, which is now undergoing tempestuous development, will most probably be shown publicly for the first time at the Paris Aerosalon. The ATR 42 is to be offered in a number of different versions. As a passenger aircraft for short-range and commuter traffic it will have two rows of two seats each. The aircraft is to be designed from the outset in such a way that it can easily be converted into a freighter by removing the seats, with a large loading door at the left rear of the fuselage. First deliveries of the ATR 42 are planned for the second half of 1985. [Text] [Gelsenkirchen AERO-KURIER in German Dec 81 p 1528] 9581

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Feb. 23, 1982